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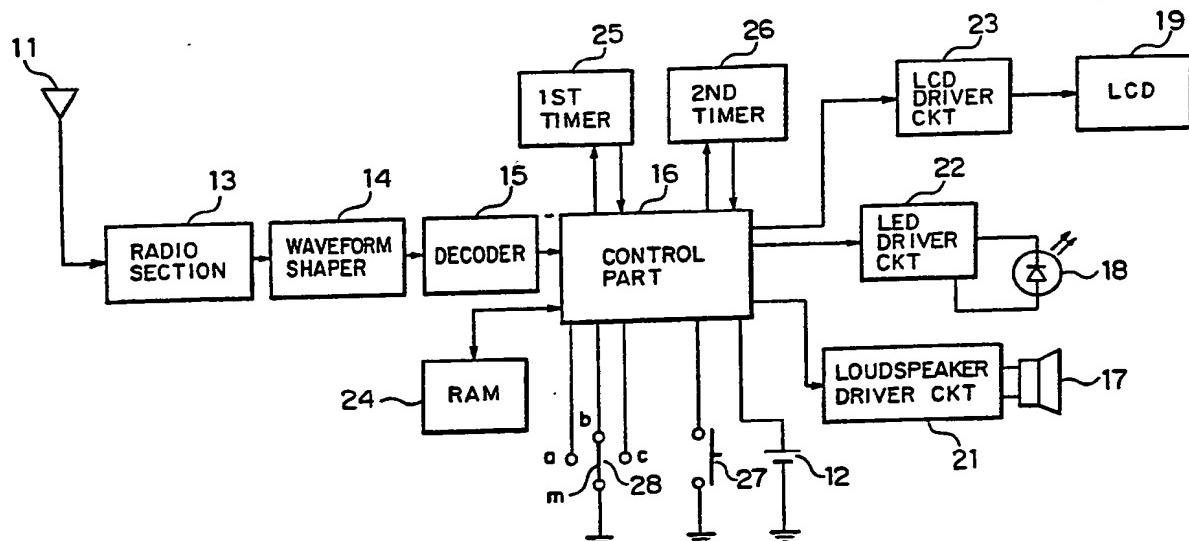
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(54) Paging receiver in which an announcing unit is automatically controlled at a particular time

(57) In a paging receiver having a plurality of receiver modes, an announcing arrangement (17, 18, 19, 21, 22, and 23) is controlled at a particular time determined at a specific time which is previous to the particular time. The paging receiver is provided with a switch (28) which is switchable to a plurality of conditions of selecting the receiver modes one at a time. A control part (16) inspects the switch to produce a condition signal representative of one of the conditions to which the switch is switched. Responsive to the condition signal, the control part controls the announcing arrangement at the particular time.



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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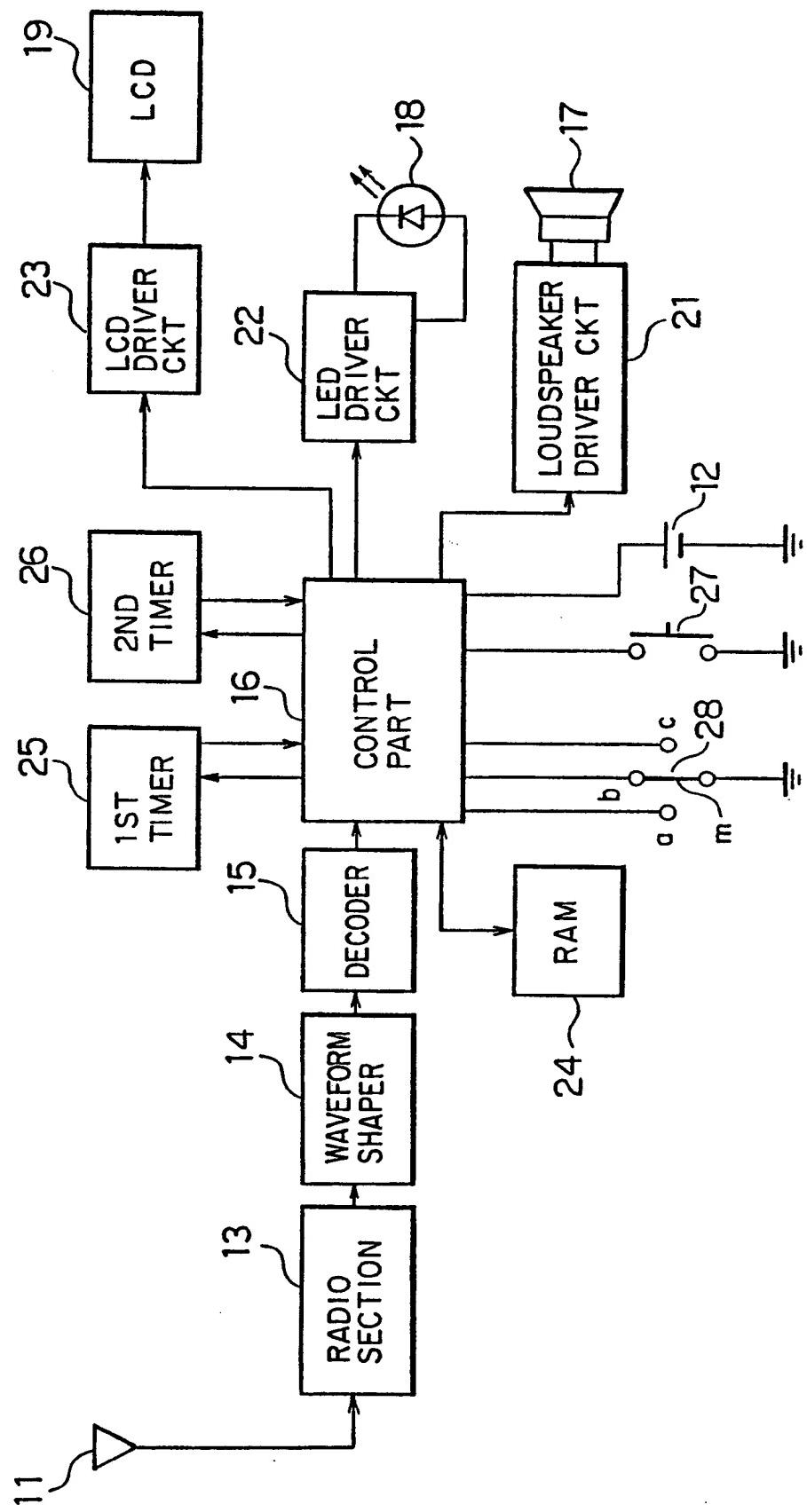


FIG. I

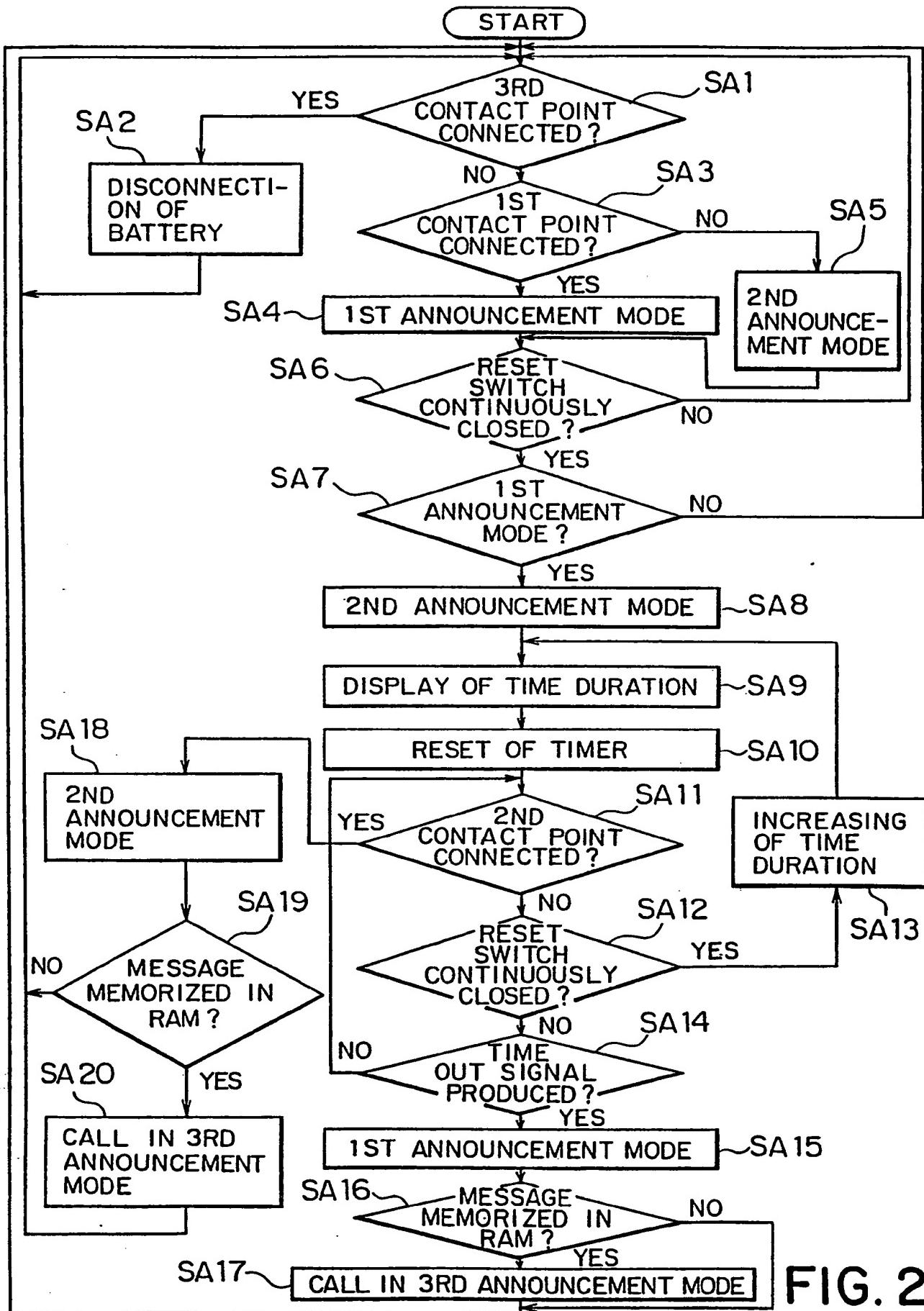


FIG. 2

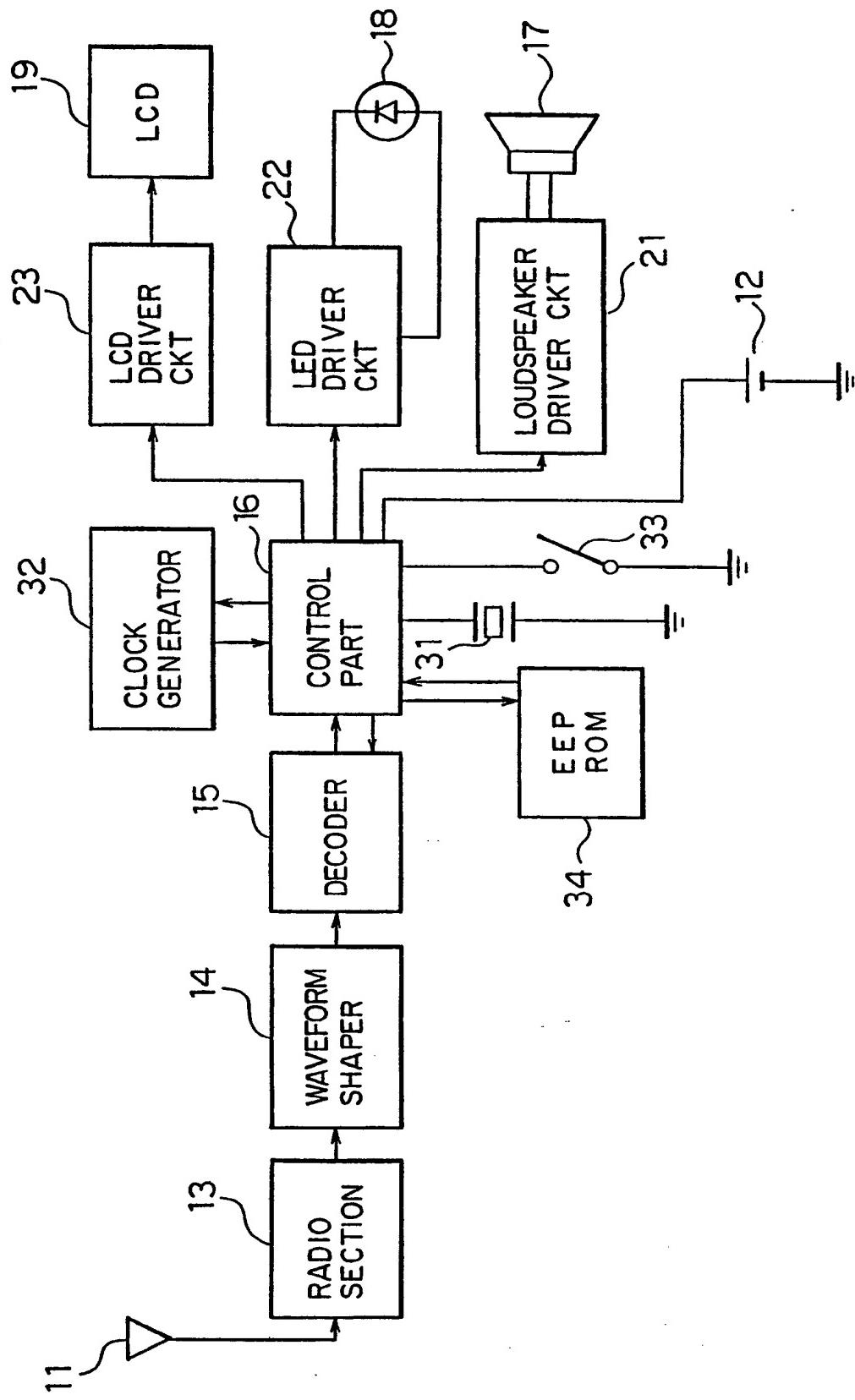


FIG. 3

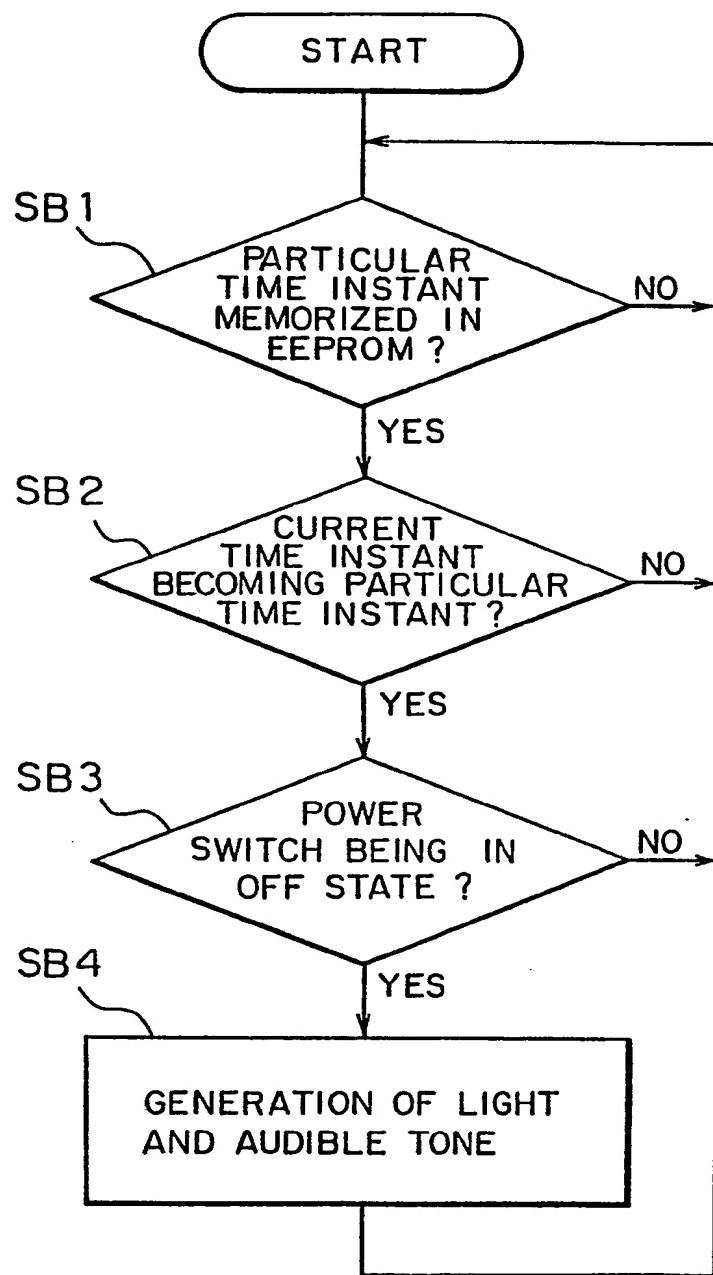


FIG. 4

PAGING RECEIVER IN WHICH AN ANNOUNCING UNIT IS
AUTOMATICALLY CONTROLLED AT A PARTICULAR TIME INSTANT

Background of the Invention:

This invention relates to a paging receiver operable in a paging system.

A conventional paging receiver includes a receiving circuit, an announcing unit, and a power switch having on and off states. The receiving circuit is for receiving a radio signal specifically directed to the receiver.

When the power switch is in the on state, the receiving circuit can receive the radio signal. When the power switch is switched to the off state, the receiving circuit can not receive the radio signal. In this manner, the paging receiver has a plurality of receiver modes which can be selected by the power switch.

The announcing unit comprises a loudspeaker and a display unit. When the radio signal is received by the receiving circuit, the loudspeaker generates a call tone which is for calling a user or an operator.

Simultaneously, the display unit provides visual display of messages.

If the user forgets to put the power switch in the on state, the receiving circuit can not receive the radio signal. Therefore, it is impossible to call the user of the paging receiver. Under the circumstances, it is desirable to inform to the user of the state of the power switch by the announcing unit in a case where the power switch is kept in the off state during a relatively long time interval.

Recently, the announcing unit has a plurality of announcement modes. In one of the announcement modes, the loudspeaker is prevented from generating the call tone. In this event, it is desirable that the announcing unit is automatically controlled to have another announcement mode in which the loudspeaker generates the call tone when the radio signal is received by the receiving circuit.

It is therefore an object of this invention to provide a paging receiver in which an announcing unit is automatically controlled at a particular time instant preliminarily determined at a specific time instant which is previous to the particular time instant.

It is another object of this invention to provide a paging receiver which is of the type described and in which the announcing unit generates an audible tone at the particular time instant even when a power switch is

kept in an off state.

It is still another object of this invention to provide a paging receiver which is of the type described and in which the announcing unit is controlled at the particular instant to have an announcement mode of making the loudspeaker generate the call tone when the radio signal is received by the receiving circuit.

Other objects of this invention will become clear as the description proceeds.

In an embodiment to be described, there is a paging receiver which has a plurality of receiver modes and comprises announcing means for carrying out announcement, a switch switchable to a plurality of conditions of selecting the receiver modes one at a time, instant determining means for determining a particular time instant at a specific time instant which is previous to the particular time instant, inspecting means connected to the switch for inspecting the switch to produce a condition signal representative of one of the conditions to which the switch is switched, and control means connected to the inspecting, the determining, and the announcing means for controlling the announcing means in compliance with the condition signal at the particular time instant.

Brief Description of the Drawing:

Fig. 1 is a block diagram of a radio paging receiver according to a first embodiment of this invention;

Fig. 2 is a flow chart for use in describing operation of the radio paging receiver illustrated in Fig. 1;

Fig. 3 is a block diagram of a radio paging receiver according to a second embodiment of this invention; and

Fig. 4 is a flow chart for use in describing operation of the radio paging receiver illustrated in Fig. 3.

10 Description of the Preferred Embodiment:

Referring to Fig. 1, a paging receiver according to a first embodiment of this invention is for selectively receiving a plurality of call signals which are specific to the receiver. Each of the call signals 15 comprises a call number signal and a message signal following the call signal and is transmitted as a radio signal from a transmitting station (not shown). The message signal is for carrying a message. The call number signal represents a call number assigned to the 20 paging receiver to which the message should be directed.

The paging receiver comprises an antenna 11 for receiving the radio signal and is connected to a battery 12 which is for supplying electric power to the paging receiver. The radio signal is picked up by the antenna 25 11 and supplied to a radio section 13. When activated by the electric power supplied from the battery 12, the radio section 13 converts or demodulates the radio signal into a baseband or demodulated signal. The demodulated

signal is supplied to a waveform shaper 14.

The waveform shaper 14 is activated by the electric power to shape a waveform of the demodulated signal into a shaped signal of a digital waveform. The 5 shaped signal is supplied to a decoder unit 15.

When activated by the electric power, the decoder unit 15 carries out judgement whether or not the call number is assigned to the paging receiver. Only when the call number is assigned to the receiver, the decoder unit 10 15 informs reception of the call signal to a control part 16 and sends the message to the control part 16. The control part 16 has operation which will later be described in detail.

The paging receiver further comprises a 15 loudspeaker 17, an LED (light emitting diode) 18, and an LCD (liquid crystal display) 19 which will be described in the following.

The loudspeaker 17 is connected to the decoder unit 15 through a loudspeaker driver circuit 21 of, for 20 example, an amplifier activated by the electric power. The loudspeaker 17 serves, in cooperation with the loudspeaker driver circuit 12, as a tone generator for generating audible tone with a controllable frequency.

The light emitting diode 18 is connected to the decoder unit 15 through an LED driver circuit 22 activated by the electric power. The light emitting diode 18 serves, in cooperation with the LED driver circuit 22, as a light generator for intermittently

generating light.

The liquid crystal display 19 is connected to the decoder unit 15 through an LCD driver circuit 23 activated by the electric power. The liquid crystal display 19 serves, in cooperation with the LCD driver circuit 23, as a display unit for providing a visual display of the message.

A combination of the tone generator, the light generator, and the display unit is referred to as an announcing arrangement for carrying out announcement.

The announcing arrangement has a first, a second, and a third announcement mode. When the announcing arrangement is in the first announcement mode, each of the tone generator, the light generator, and the display unit is driven. In this event, the tone generator generates the audible tone having a predetermined frequency. When the announcing arrangement is in the second announcement mode, each of the light generator and the display unit is driven. The tone generator is not driven. When the announcing arrangement is in the third announcement mode, each of the tone generator, the light generator, and the display unit is driven as is similar to a case where the announcing arrangement is in the first announcement mode. In this event, the tone generator generates the audible tone having another frequency which is different from the predetermined frequency.

The paging receiver further comprises an RAM (random access memory) 24, a first timer 25, and a second timer 26 which are connected to the control part 16. The random access memory 24 is for memorizing the message.

5 The first timer 25 is for determining a first predetermined time duration, which may be three seconds long. The second timer 26 is for determining a second predetermined time duration, which may be fifteen minutes long.

10 The paging receiver further comprises a manually operable reset switch 27 and a mode selection switch 28, both of which are connected to the control part 16. The reset switch 27 has on and off states. When closed to the on state by a possessor of the radio paging receiver, 15 the reset switch 27 produces an announcement stop instruction signal which serves to make the announcing arrangement stop the announcement.

The mode selection switch 28 is switchable to a plurality of conditions of selecting a first, a second, and a third receiver modes one at a time. In particular, 20 the mode selection switch 28 comprises first, second, and third fixed contact points a, b, and c and a movable contact member m which is selectively connected to a selected one of the first, the second, and the third 25 fixed contact points a, b, and c.

When the movable contact member m is connected to the first fixed contact point a by the possessor of the radio paging receiver, the paging receiver is in the

first receiver mode in which the control part 16 puts the announcing arrangement into the first announcement mode. When the movable contact member m is connected to the second fixed contact point b, the paging receiver is in
5 the second receiver mode in which the control part 16 puts the announcing arrangement into the second announcement mode. When the movable contact member m is connected to the third fixed contact point c, the paging receiver is in the third receiver mode in which the
10 control part 16 disconnects the battery 12 from the paging receiver.

Referring to Fig. 2 together with Fig. 1, operation of the control part 16 will be described in detail. A start stage proceeds to a first stage SA1 at
15 which the control part 16 inspects the mode selection switch 28 to produce a condition signal. In other words, judgement is carried out in the control part 16 whether or not the movable contact member m is connected to the third fixed contact point c. Herein, the control part 16
20 is referred to as an inspecting arrangement.

When the movable contact member m is connected to the third fixed contact point c, the first stage SA1 is followed by a second stage SA2. At the second stage SA2, the control part 16 makes the battery 12 be disconnected
25 from the paging receiver. As a result, the paging receiver is put into the third receiver mode. The second stage SA2 returns to the first stage SA1.

When the movable contact member m is not connected to the third fixed contact point c, the first stage SA1 proceeds to a third stage SA3 at which the control part 16 carries out judgement whether or not the movable contact member m is connected to the first fixed contact point a. When the movable contact member m is connected to the first fixed contact point a, the third stage SA3 is followed by a fourth stage SA4 at which the paging receiver is found to be in the first receiver mode. Therefore, the control part 16 puts the announcing arrangement into the first announcement mode.

When the movable contact member m is not connected to the first fixed contact point a, the third stage SA3 proceeds to a fifth stage SA5 at which the paging receiver is found in the second receiver mode. Therefore, the control part 16 puts the announcing arrangement into the second announcement mode. Each of the fourth and the fifth stages SA4 and SA5 is followed by a sixth stage SA6.

At the sixth stage SA6, the control part 16 carries out judgement whether or not the reset switch 27 is closed continuously during the first predetermined time duration that is determined by the first timer 25. When the reset switch 23 is opened before lapse of the first predetermined time duration, operation returns to the first stage SA1. Herein, the reset switch 23 will be referred to as a manually operable producing arrangement for producing a determining signal.

When the reset switch 27 is continuously closed during the first predetermined time duration, the sixth stage SA6 proceeds to a seventh stage SA7 at which the control part 16 carries out judgement whether or not the 5 announcing arrangement is in the first announcement mode. When the announcing arrangement is in the first announcement mode, the seventh stage SA7 is followed by an eighth stage SA8 which will be described in the following. Otherwise, the seventh stage SA7 returns to 10 the first stage SA1.

At the eighth stage SA8, the control part 16 puts the announcing arrangement into the second announcement mode. When the call signal is received while the announcing arrangement is put in the second announcement 15 mode, the message is memorized in the random access memory 24. herein, the control part 16 will be referred to as a second selecting arrangement.

The eighth stage SA8 is succeeded by a ninth stage SA9 at which the control part 16 makes the liquid 20 crystal display 19 provide a predetermined numeral "15" as the visual display thereon. The ninth stage SA9 is succeeded by a tenth stage SA10 at which the control part 16 resets the second timer 26 and makes the second timer 26 start operation of the second timer 26. The second 25 timer 26 produces a time out signal when the second predetermined time duration lapses after the second timer 26 is started. Therefore, the second timer 26 will be referred to herein as an internal determining

arrangement. A combination of the internal determining and the manually operable producing arrangements is referred to as an instant determining arrangement for determining a particular time instant at a specific time instant which is previous to the particular time instant.

The tenth stage SA10 is succeeded by an eleventh stage SA11. At the eleventh stage SA11, the control part 16 carries out judgement whether or not the movable contact member m is connected to the second fixed contact point b. When the movable contact member m is not connected to the second fixed contact point b, the eleventh stage SA11 is followed by a twelfth stage SA12.

At the twelfth stage SA12, the control part 16 carries out judgement whether or not the reset switch 27 is continuously closed during the first predetermined time duration that is determined by the first timer 25. When the reset switch 27 is continuously closed during the first predetermined time duration, the twelfth stage SA12 is followed by a thirteenth stage SA13 at which the control part 16 makes the second timer 26 increase the second predetermined time duration. Such an increasing of the second predetermined time duration may be fifteen minutes long. The thirteenth stage SA13 returns to the eighth stage SA8.

When the reset switch 23 is not continuously closed during the first predetermined time duration, the eleventh stage SA11 is followed by a fourteenth stage SA14 at which the control part 16 carries out judgement

whether or not the time out signal is produced by the second timer 26. When the time out signal is produced, the fourteenth stage SA14 is followed by a fifteenth stage SA15 which will be described in the following.

- 5 Otherwise, the fourteenth stage SA14 returns to the eleventh stage SA11.

At the fifteenth stage SA15, the control part 16 puts the announcing arrangement into the first announcement mode. Herein, the control part 16 will be referred to as a first selecting arrangement. A combination of the first and the second selecting arrangements will be referred to as an announcement mode selecting arrangement. The fifteenth stage SA15 proceeds to a sixteenth stage SA16.

15 At the sixteenth stage SA16, the control part 16 carries out judgement whether or not the message is memorized in the random access memory 24. When the message is memorized in the random access memory 24, the sixteenth stage SA16 proceeds to a seventeenth stage SA17 which will be described in the following. Otherwise, the sixteenth stage SA16 returns to the first stage SA1.

At the seventeenth stage SA17, the control part 16 puts the announcing arrangement into the third announcement mode and makes the announcing arrangement announce the announcement in relation to the message that is memorized in the random access memory 24. The seventeenth stage SA17 returns to the first stage SA1.

Attention will be directed to a case where the movable contact member m is connected to the second fixed contact point b at the eleventh stage SA11. In the case, the eleventh stage SA11 proceeds to an eighteenth stage 5 SA18 at which the control part 16 puts the announcing arrangement into the second announcement mode. The eighteenth stage SA18 proceeds to a nineteenth stage SA19.

At the nineteenth stage SA19, the control part 16 10 carries out judgement whether or not the message is being memorized in the random access memory 24. When the message is memorized in the random access memory 24, the nineteenth stage SA19 proceeds to a twentieth stage SA20 which will be described in the following. Otherwise, the 15 nineteenth stage SA19 returns to the first stage SA1.

At the twentieth stage SA20, the control part 16 puts the announcing arrangement into the third announcement mode and makes the announcing arrangement announce the announcement in relation to the message that 20 is memorized in the random access memory 24. The twentieth stage SA20 returns to the first stage SA1.

When the fourteenth stage SA14 is carried out, the control part 16 produces a determining signal and will therefore be referred to herein as a producing 25 arrangement. Responsive to the determining signal, the first selecting arrangement selects the first announcement mode at the fifteenth stage SA15.

In the example described in conjunction with Figs. 1 and 2, the announcing arrangement is controlled at the particular instant to have the first announcement mode even if the pager receiver is put in the second receiver mode at the current time instant. Therefore, it is insured that the announcing arrangement is not put in the second announcement mode during a long time interval.

Referring to Fig. 3, the description will proceed to a paging receiver according to a second embodiment of this invention. The paging receiver comprises similar parts designated by like reference numerals.

The paging receiver further comprises a quartz crystal oscillator 31, a clock generator 32, and a power switch 33 which will be described in the following.

The quartz crystal oscillator 31 is connected to the control part 16 and generates a clock signal which is supplied to the control part 16. In addition, the clock signal is supplied to the clock generator 32 through the control part 16.

The clock generator 32 is connected to the control part 16 and produces a current time signal representative of a current time instant. Generally, the control part 16 sends the current time signal to the LCD driver circuit 23 to make the liquid crystal display 19 provide the current time instant as the visual display. The clock generator 32 will be referred to as a generating arrangement.

The power switch 33 is connected to the control part 16 and has on and off states. When the power switch 33 is in the on state, the paging receiver can receive the radio signal. When the power switch 33 is in the off state, it is impossible to receive the radio signal by the paging receiver.

The paging receiver further comprises an EEPROM (electrical erasable programmable read only memory) 34 for memorizing an identification number which is specific to the illustrated paging receiver. In the manner known in the art, the decoder unit 15 compares the call number with the identification number that is read out from the electrical erasable programmable read only memory 34. When the call number is coincident with the identification number, the control part 16 controls each of the loudspeaker, the LED, and the LCD driver circuits 22, 23, and 24.

In addition, the electrical erasable programmable read only memory 34 can memorize the particular time instant at the specific time instant. The particular time instant may be determined by the possessor. The electrical erasable programmable read only memory 34 is referred to as the instant determining arrangement.

The control part 16 carries out judgement with reference to the current time signal whether or not the current time instant becomes the particular time instant. When the current time becomes the particular time instant, the control part 16 produces a particular time

signal. Responsive to the particular time signal, the control part 16 controls the announcing arrangement as will later be described in detail.

- Referring to Fig. 4 together with Fig. 3, 5 operation of the control part 16 will be described in detail. A start stage proceeds to a first stage SBl at which the control part 16 carries out judgement whether or not the particular time instant is memorized in the electrical erasable programmable read only memory 34.
- 10 When the particular time instant is memorized in the electrical erasable programmable read only memory 34, the first stage SBl proceeds to a second stage SB2 which will be described in the following. Otherwise, the first stage SBl is repeatedly carried out.
- 15 At the second stage SB2, the control part 16 carries out judgement whether or not the current time instant becomes the particular time instant. When the current time instant becomes the particular time instant, the second stage SB2 proceeds to a third stage SB3 which 20 will be described in the following. Otherwise, the second stage SB2 returns to the first stage SBl. When the second stage SB2 is carried out, the control part 16 will be referred to as a judging arrangement.
- At the third stage SB3, the control part 16 25 carries out judgement whether or not the power switch 33 is in the off state. Namely, the control part 16 inspects the power switch 33 to produce a switch-off signal as the condition signal. Therefore, the control

part 16 is referred to herein as the inspecting arrangement. When the power switch 33 is in the off state, the third stage SB3 proceeds to the fourth stage SB4 which will be described in the following. Otherwise,
5 the third stage SB2 returns to the first stage SB1.

At the fourth stage SB4, the control part 16 makes the announcing arrangement generate an alert as the announcement in compliance with the switch-off-signal at the particular time instant. Namely, the loudspeaker 17
10 generates the audible tone. Simultaneously, the light emitting diode 18 intermittently generates the light. The fourth stage SB4 returns to the first stage SB1.

In the example being illustrated in Figs. 3 and 4, the announcing arrangement generates the audible tone
15 and the intermittently generated light at the particular time instant even when a power switch 33 is kept in the off state. Therefore, the possessor is advised with that the power switch 33 is in the off state.

While the present invention has thus far been
20 described in connection with only a few embodiment thereof, it will readily be possible for those skilled in the art to put the invention, as defined in the appended claims, into practice in various other ways. For example, another time instant may be determined in the electrical
25 erasable programmable read only memory 34 in addition to the particular time instant.

CLAIMS

1. A paging receiver having a plurality of receiver modes and comprising:

announcing means for carrying out announcement;

a switch switchable to a plurality of conditions

5 of selecting said receiver modes one at a time;

instant determining means for determining a particular time instant at a specific time instant which is previous to said particular time instant;

inspecting means connected to said switch for 10 inspecting said switch to produce a condition signal representative of one of said conditions to which said switch is switched; and

control means connected to said inspecting, said determining, and said announcing means for controlling 15 said announcing means in compliance with said condition signal at said particular time instant.

2. A paging receiver as claimed in Claim 1, wherein said instant determining means comprises:

manually operable producing means for producing a determining signal; and

5 internal determining means connected to said manually operable producing means for determining a predetermined time duration in compliance with said determining signal, said internal determining means producing a time out signal when the predetermined time 10 duration lapses after production of said determining

(Claim 2 continued)

signal;

said control means being connected to said internal determining means for controlling said announcing means in compliance with said time out signal.

3. A paging receiver as claimed in Claim 1, wherein said announcing means has a plurality of announcement modes, said instant determining means producing a particular time signal at said particular 5 time instant, said control means comprising announcement mode selecting means connected to said announcing, said inspecting, and said instant determining means for selecting a selected one of said announcement modes in compliance with said one of the conditions and said 10 particular time signal.

4. A paging receiver as claimed in Claim 3, said announcement modes being first and second announcement modes, wherein said announcement mode selecting means comprises:

5 first selecting means connected to said announcing means for selecting said first announcement mode as said selected one of the announcement modes; and
 second selecting means connected to said announcing, said inspecting, and said instant determining 10 means for selecting said second announcement mode as said selected one of the announcement modes in compliance with said condition signal and said particular time signal.

5. A paging receiver as claimed in Claim 4,
wherein said instant determining means comprises
producing means for producing a determining signal, said
first selecting means being connected to said producing
means for selecting said first announcement mode in
accordance with said determining signal.

6. A paging receiver as claimed in Claim 1,
wherein said switch is a power switch having on and off
states as said plurality of conditions, said inspecting
means being connected to said power switch for inspecting
said power switch to produce a switch-off signal as said
condition signal when said power switch is in said off
state at said particular time instant, said control means
being for making said announcing means generate an alert
signal as said announcement in response to said
switch-off signal.

7. A paging receiver as claimed in Claim 1,
wherein said instant determining means comprises:
generating means for generating a current time
signal representative of a current time instant;
5 a memory connected to said instant determining
means for memorizing said particular time instant; and
judging means connected to said generating means
and said memory for judging with reference to said
current time signal whether or not said current time
10 instant becomes said particular time instant, said
judging means producing a particular time signal when
said current time becomes said particular time instant;

(Claim 7 continued)

said control means being connected to said judging means for controlling said announcing means in compliance with said particular time signal.

8. A paging receiver as claimed in Claim 7, wherein said memory is an electrically erasable programmable read only memory.

9. A paging receiver comprising:
means for receiving a paging signal addressed to said paging receiver;

means for annunciating one of the reception of a 5 paging signal and conditions of said paging receiver;

means for setting a particular time instant; and
means coupled to said setting means for controlling said annunciating means at said particular time instant.

10. A paging receiver as claimed in Claim 9, wherein said conditions comprise at least the annunciate modes of said annunciating means.

11. A paging receiver as claimed in Claim 9, wherein said conditions comprise at least the on-off states of said paging receiver.

12. A method of controlling an annunciator of a paging receiver, comprising the steps of:

(a) receiving a paging signal addressed to said paging receiver;

5 (b) annunciating one of the reception of a paging signal and conditions of said paging receiver;

(Claim 12 continued)

(c) setting a particular time constant; and
(d) controlling said annunciating step (b) at
said particular time constant.

13. A method as claimed in Claim 12, wherein
said setting step (c) comprises the step (cl) of manually
setting said particular time constant.

14. A paging receiver as claimed in claim 1
substantially as described herein with reference to Figs. 1
and 2, or Figs. 3 and 4 of the accompanying drawings.

15. A paging receiver as claimed in claim 9
substantially as described herein with reference to Figs. 1
and 2 or Figs. 3 and 4 of the accompanying drawings.

16. A method of controlling an annunciator of a
paging receiver as claimed in claim 12 substantially as
described herein with reference to Figs. 1 and 2, or
Figs. 3 and 4 of the accompanying drawings.

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